



**6100 SERIES**  
**EXPANDABLE MIXING SYSTEM**

**OWNER'S MANUAL**

a gulton company

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## 1. Introduction

The 6100 series mixers are the natural result of exhaustive laboratory research and actual field testing. This mixer is designed to be easy to use, and to provide optimum performance under even the most demanding conditions.

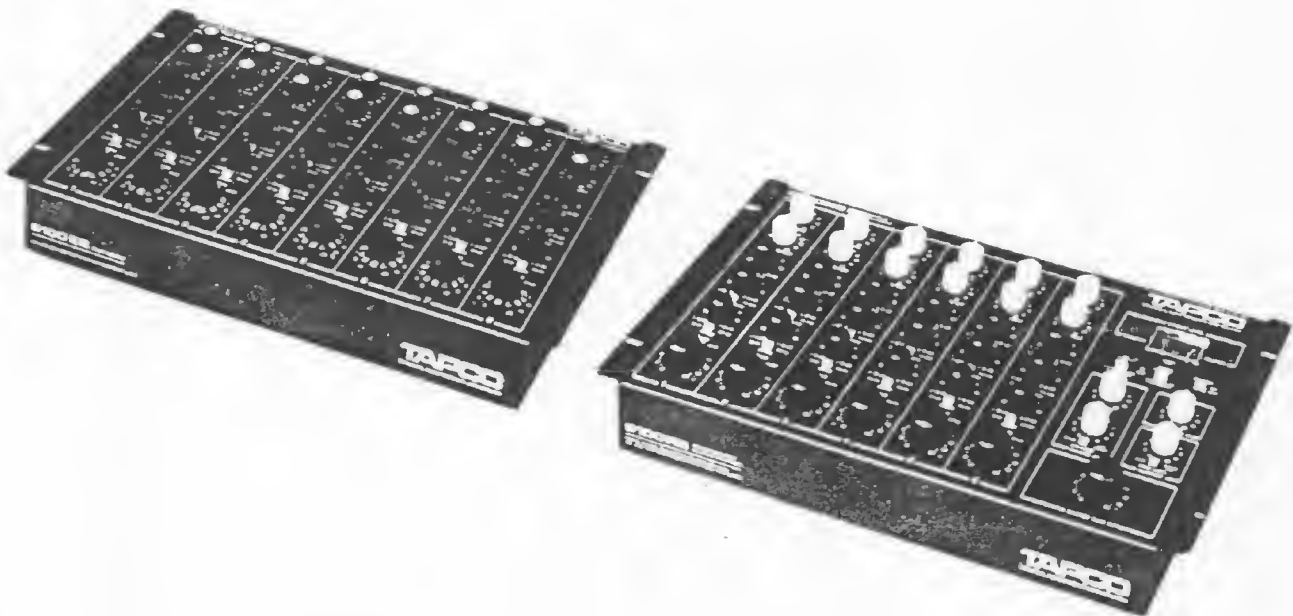
The 6100 mixing system incorporates every one of TAPCO's time-tested design and construction techniques into a unit that gives you every control you need, and a format designed specifically for live music sound reinforcement.

Every input channel has an AutoPad® volume control, switchable bass and midrange controls, a treble control, an effects/reverb send control and an independent monitor control. The output section has master volume, master monitor, reverberation controls, switchable microphone equalization and rumble filters and effects return level controls. Output levels are constantly monitored by a pair of meters for monitor and master out. The net result of all these features is precise audio control — more control means better sound, and better sound is what you get with the 6100.

More and more, popular music is becoming a truly symbiotic combination of artistry and technology. New techniques have made records sound almost better than the real thing, and high quality playback systems are found in almost every living room. Electronic

musical instruments have expanded the range of modern music so that entire symphonic performances are now given with just one instrument, the synthesizer. Musicians have come to depend upon electronic systems through sound reinforcement, recording and broadcasting, to get their music to the public. And, of course, the public has come to depend upon those same systems. The quality of sound experienced by most people today is so good that it's taken for granted. It's just part of our everyday lives. As a result, poor quality sound becomes glaringly apparent, and this is taken, unfortunately, as an indication of the quality of the music itself. Music is no longer judged simply by the quality of the performance, because people will no longer accept poor quality sound.

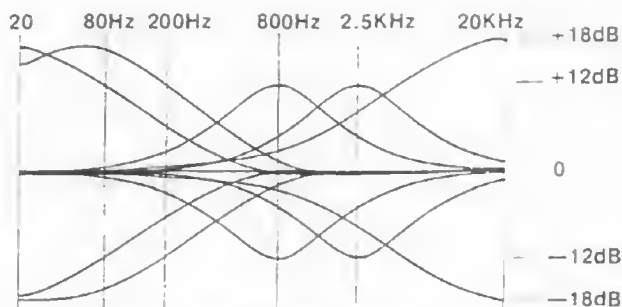
You don't expect high performance from outdated equipment. We can only assume that's why you now own a 6100 system. But it's not always the equipment that's at fault when the sound is bad. The world's best equipment can't cure your sound problems if it's not used properly. To that end, we urge you to read your Owner's Manual carefully. It provides the informational tools you need to learn to play the 6100 just as you would play a musical instrument. The control functions on the 6100 are meant to be dynamic — they are meant to be used. The settings on your mixer must flow just as smoothly as the music itself in order to produce a perfectly blended composite product. In the final analysis, the quality of the music will be only as good as the quality of the mixing.





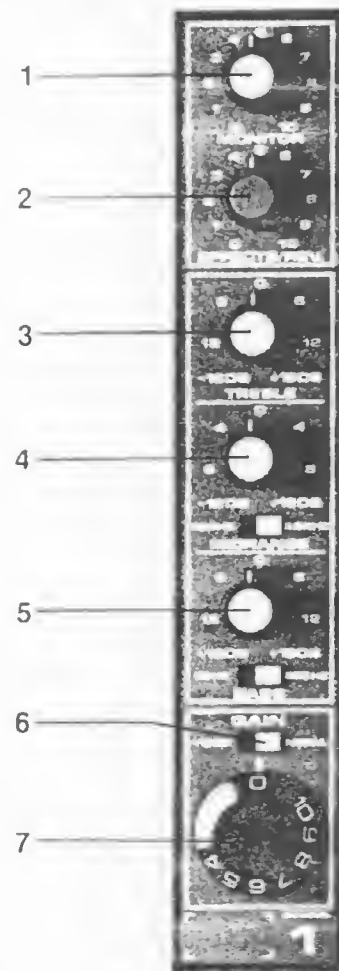
### 3. Input Control Functions

1. **MONITOR** controls the loudness of the individual input channel in the completely separate mix that appears at the MONITOR SEND jack. THE MONITOR CONTROL IS *PRE EVERYTHING* — IT IS NOT AFFECTED BY ANY OTHER CONTROL SETTINGS ON THE INPUT CHANNEL. With this pre-everything monitor system you never have to reset the stage monitors to compensate for changes in the house mix. See Section 7, "How to use the 6100 System" for more specific information on setting up the monitors and a couple other ways to use the circuit.
2. **EFFECTS/REV.** sets the amount of reverberation or special effects added from the input channel. This control sends signals simultaneously to both the internal reverb system and to the EFFECTS SEND jack located on the back panel. When either or both of these systems are in use the overall amount of reverb or effects heard at the output is set by the corresponding master section effects level control. The EFFECTS/REV control is *post everything* — the signal is subject to all the control settings on the input channel *except* MONITOR.



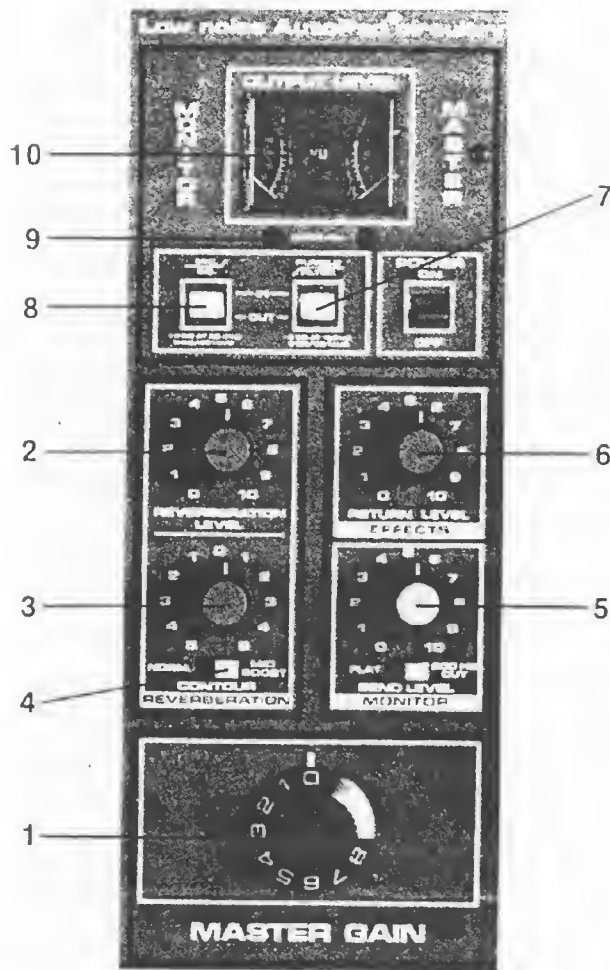
Channel EQ Curves

3. **TREBLE** is set to give you 18dB of boost or cut at 20KHz. Above 20KHz the response is gradually rolled off so ultrasonic frequencies are not over compensated.
4. **MIDRANGE** can be boosted or cut 12dB at either the 800Hz or 2.5KHz position. These are the frequencies at which you get full boost or cut from the control, but as you can see in the response curves they are most assuredly not the *only* frequencies affected. The selectivity of the peak and dip function of the midrange has been carefully set up to give you proper control, in either the mid or upper-mid frequency position.
5. **BASS** knob controls two different ranges of sound as determined by the selector switch directly below it on the control panel. The 80Hz position gives you control over the lower bass, while the 200Hz position gives you more control over the mid-bass region. The shelving characteristic of the circuitry provides 18dB of boost or cut.



6. **NORM/-15 SWITCH:** The gain range switch expands the operating range of the input gain control. For example, if you have a singer who eats the mike and screams a lot, you can put the range switch in the -15 position and turn up the volume control a bit for better controllability.
7. **GAIN** determines the loudness of the individual input channel. This control actually varies the sensitivity of the input preamp, so the characteristics of the preamp itself can be matched to the incoming signal level. We call this type of control AutoPad<sup>®</sup> because it effectively performs the function of a conventional pad (protects the preamp from overload) and regulates loudness at the same time. With AutoPad<sup>®</sup> gain controls, input overload distortion can be eliminated just by turning down the volume a little.

## 4. Output Control Functions



1. **MASTER GAIN** governs the loudness of the main output signal (as indicated by the Master Output Level meter). The MASTER GAIN control utilizes AutoPad® circuitry so you can actually control the sensitivity of the mix amp. This is very important: The MASTER GAIN control on the 6100 is used differently from the usual output level lader found on conventional mixers. It regulates the output signal level by changing how much the mix amp amplifies. And, in fact, the circuit can be made to actually decrease the overall gain if necessary. When you set your mix with the 6100, remember that the master section is designed only to MIX the signals from all the input preamps together. It is not designed to boost the signal level. In practice, this means that you should always run the input gain controls higher than the master gain. This will allow the super-quiet input preamps to do the actual work of boosting the signals to a usable level, while the mix-amp combines the signals from all the inputs.
2. **REVERBERATION LEVEL** sets the overall amount of reverb present in the main output signal

3. **REVERBERATION CONTOUR** changes the timbre of the reverberated signal. It has no effect on the dry signal.
4. **MID-BOOST NORMAL** switch sets the EQ operating range of the contour control.
5. **MONITOR** sets the overall level of the signal fed to the Monitor Send jack (as indicated by the Monitor Output Level meter). The entire monitor system in the 6100 utilizes AutoPad® circuitry. The 200Hz cut switch activates a high pass filter that rolls off the low end frequencies like the Main Output Rumble Filter.
6. **EFFECTS RETURN** governs the level of any external effects device (or any other signal source, for that matter) being fed into the Effects Return jack. This control is also an AutoPad® circuit so it's virtually impervious to overload, and will match the Effects Return circuitry to practically anything you've got.
7. **RUMBLE FILTER** rolls off some of that non-musical mess that often accumulates in the extreme low end of the sound spectrum. The filter circuit has a 6dB per octave slope, and is down 6dB at 100Hz. This allows you to reduce floor rumble and bass leakage *without* disturbing the more noticeable mid-bass sounds. The input channel bass controls and the rumble filter can be quite complementary, and should be used together to tailor the low end response of the sound system.
8. **MICROPHONE EQUALIZATION** is a special circuit that boosts the extreme high end frequency response. The actual amount of boost provided by the Mic. EQ switch is shown in the graph on the specifications page. This gentle high end boost is used to help correct deficiencies in mikes and speakers. It is a much different sounding EQ from the regular input channel treble controls, and should be used in conjunction with those controls to get just the right sounding high end frequency response. Try a few combinations of the treble controls and the Mic. EQ switch. Mic. EQ allows you to get more high end without boosting the upper mid-range as much as the treble controls do. You might find the Mic. EQ useful for brightening up some of those old, faded mikes and speakers you've got hanging around.
9. **METER ADJUST** sets the reference level of the Output Meters. Adjust the meters to match the input sensitivity of your power amp, or to indicate 0 VU at the maximum volume you want from your house and monitor speakers. There's more on this in Section 7.
10. **OUTPUT LEVEL METERS** give you a constant readout of both the main and monitor output level. Separate meters are provided because the two systems are completely independent in the 6100. The meters are adjustable to indicate 0 VU anywhere between .11V (—17dBm) and 9V (+19dBV), so you can relate them to any other equipment you have.

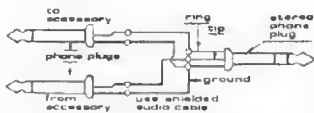
## 5. Input Channel Connectors

**1. LOW-Z MIC:** A standard 3-pin XLR connector is provided for all microphone inputs — THE 6100 SYSTEM IS INTENDED FOR USE WITH LOW IMPEDANCE MICROPHONES ONLY! The input impedance matching characteristics are designed to be used in any situation — even those requiring mike splitters. The 6100A series is equipped with radio frequency rejection circuitry, and the 6100B series is equipped with transformer coupled balanced inputs. Both will accept input levels as high as 680MV (—2dBm) which is almost line level, so there's always plenty of headroom.

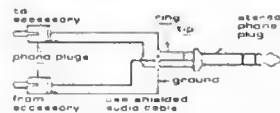
**2. CHANNEL PATCHING:** This clever little space saving (two-connectors-in-one) jack allows you to add external signal processing gear to a particular channel, without disturbing any of the other channels. A 3-conductor (stereo) phone plug is used for both the output from the channel preamp and for the return to the mixer's output stages from the external processing device. The diagram indicates how a channel patching cord should be wired — but if you're not into making your own we have them available (check the Accessories page).

The channel patching jack can be used with equalizers, limiters, compressors, reverb systems and the like. Just be sure the device you want to patch in has *line level* inputs and outputs.

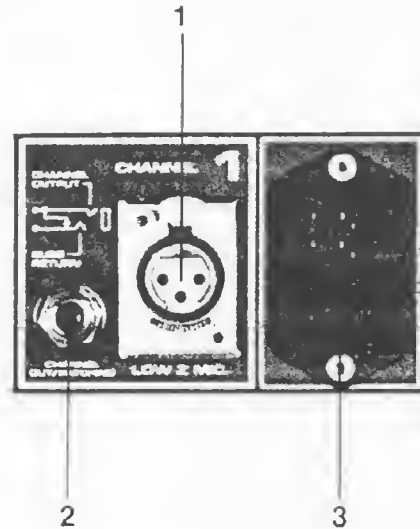
### HOW TO WIRE A CHANNEL PATCHING CORD



For Musical Instrument Equipment

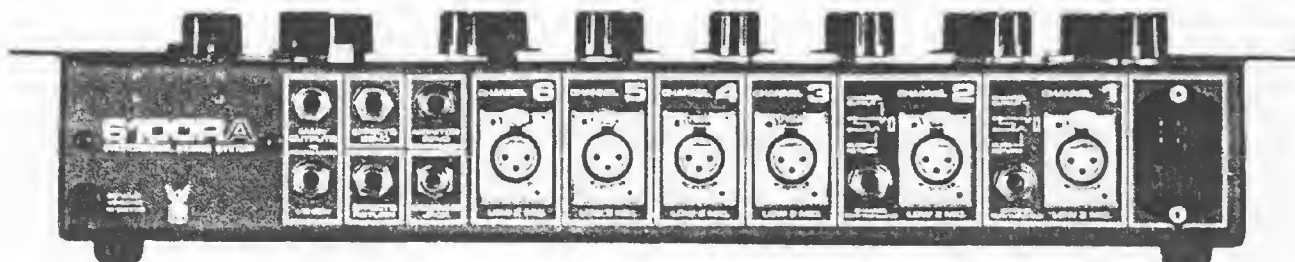


For Hi-Fi Equipment

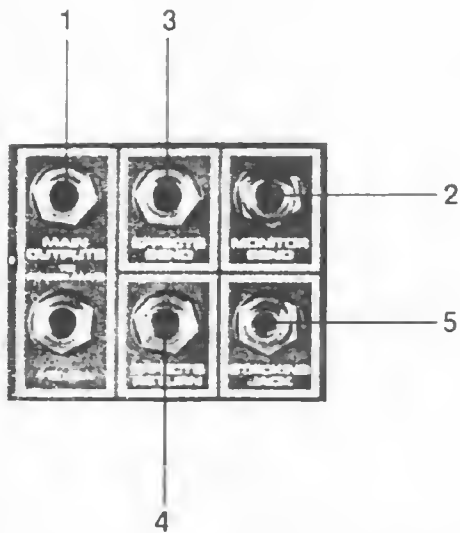


### NOTES:

**3. EXPANDER JACK:** This 8 pin connector is used to hook up a single expander unit (6100EA or 6100EB). It connects all the main busses together, and provides power to the expander, via the hook-up cable provided with each 6100E.



## 6. Output Channel Connectors



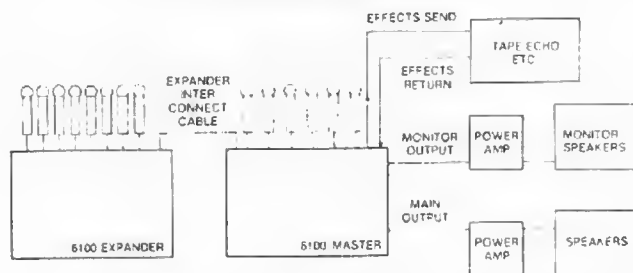
### NOTES:

- 1. MAIN OUTPUTS:** These 1/4" phone jacks carry signals as determined by the input channel controls and the Master Gain control. The Main Outputs are used to feed signals from the mixer to any high level input (power amps, tape recorders, reverbs, compressors, etc.) The line level outputs are capable of delivering up to 9 volts RMS into impedances greater than 5K ohms, with the level being set by the Master Gain control. Special protection circuitry makes the 6100's output line drivers impervious to destruction from accidental misconnection.
- 2. MONITOR SEND:** Output from the master monitor buss (capable of 9VRMS into 5K ohms). Signals are sent from each individual input channel, and the total signal level is determined by the master monitor send level control. Protection circuits are included as in the master output.
- 3. EFFECTS SEND:** Signals derived from the individual channel's effects/rev. controls are sent out of the mixer through the effects send jack. This output may be used to drive any external processing or recording system you may want to use — phase shifters, flangers, tape echo machines, power amps, tape recorders, etc. If you wish to feed the output of an external processing system back into the 6100's mixing stages, run it into the effects return jack.
- 4. EFFECTS RETURN:** This connector is used to feed signals directly into the output mixing stages of the mixer. The input impedance of the effects return circuit will match all common effects devices, like phase shifters, digital delays, Echo-plex, reverbs, etc. The effects return level control utilizes AutoPad<sup>®</sup> circuitry so the level can be made to match virtually anything. The maximum input level is 10 volts RMS, so there's plenty of headroom in any case.
- 5. STACKING JACK:** When more than one master control unit is needed, *two units can be paralleled by connecting their stacking jacks.* (The 6100's stacking connector is compatible with the stacking jack on any Tapco mixer.) You'll notice on the block diagram that the stacking connector enters the signal path after the master gain control but before the output line driver. Thus, if units are stacked, their individual master gain controls become submasters, controlling the level of only their directly related inputs. In addition, signals from both mixers appear on each other's outputs, so *only one output needs to be connected to the following power amp.* It should be noted here that when 2 units are paralleled via the stacking connectors, you will need to turn up the master volumes a bit to achieve the same output level as with a single unit.



## 7. How To Use The 6100 System

### TYPICAL HOOKUP



The 6100 System is designed to offer all the versatility you need for any sound reinforcement job, and still be easy to use. As you can see in the diagram, the basic setup is really straightforward. We've illustrated the most common use for all of the 6100's input and output connections. The first time you set up your system with the 6100, use the following control settings:

#### INPUT CHANNELS

Input channel gain	4
Gain range switch	Norm
EQ	All flat
Effects/Rev.	5
Monitor	5

#### MASTER SECTION

Master gain	3
Reverberation Contour	switch norm, knob 0
Reverberation level	3
Monitor send level	switch flat, knob 3
Effects Return	this depends upon the output level of your effects device try 5 to start with.

Setting the mixer up like this to start with will at least get some signal in and out of all the connectors, so you can figure out what you need to do to make the 6100 work just right in your particular situation. In any case, always make *all* the necessary connections and inter-connections in your system before you turn anything on. Then:

1. Turn on the mixer and any other low level equipment in the system. Give everything a few seconds to fully stabilize.
2. Turn on the power amp(s).

When you shut down the system, turn the power amps off first, and always allow 30 seconds or so for the power supply capacitors to fully discharge before you turn off the low level equipment. This simple routine may save your speakers, because nearly all low level sound equipment produces some sort of "turn on thump". So, to avoid the remote possibility that your speakers could be traumatized or even killed by this unexpected DC transient, make sure the power amps are off whenever you turn your low level equipment on or off. By low level, incidentally, we mean *everything* except power amps. Remember, if a little DC gets through when the power amp's off, it's of no consequence. But if it's on...

Tapco products are designed to keep any turn-on thump within very strict limits — that's just a part of the way we do things. But, we can't speak for anyone else, so play it safe.

## EQUALIZATION

The individual channel equalizers add tremendous flexibility to the 6100's mixing capabilities. Switchable frequencies and a very wide range of control give you the ability to make everything sound just the way you want it to.

It is generally accepted that any equipment used for professional sound work must have a wide, flat frequency response. Thus we are assured of high quality, real sounding reproduction. However, in live music PA systems it is often necessary to purposely change or restrict the frequency response of many of the input channels, in order to come up with good sound quality. Equalization can be used to create a "feedback safety margin" by eliminating all the unused parts of the audio spectrum, or by changing the response of one or another part of the spectrum. Acoustic feedback actually begins long before that terrible howling sound steals the show — it's the more subtle effects of beginning feedback that can make the whole system sound bad, even though it may never break into a full howl. This slight ringing (sounds almost like a really crummy reverb) becomes more and more of a problem as the number of microphones increases. Use the 6100's input equalizers to set up the frequency response of the mike inputs so only the really necessary information is amplified. An open mike on a stage full of loud music is kind of like a radio antenna, in that it will pick up a little of everything. The equalizers can be used kind of like a tuner, to zero in on the sound you want. By carefully selecting your equalization you can eliminate "interference" and get a cleaner overall sound.

Cleaner overall sound — that's what we're all after. Wouldn't it be great if you could duplicate the perfect sound of the studio on stage? Very difficult proposition of course, but certainly an ideal worth working toward. Two of the most noticeable qualities of good studio recordings are a definite lack of crosstalk, and a high degree of definition. Every sound source seems almost perfectly isolated, and perfectly clear. Crosstalk, sounds leaking in from outside the direct pickup pattern of a mike, can be reduced on stage with the 6100's input equalizers. Actually the problems of crosstalk and definition go hand in hand — you can't have a high degree of definition when there's too much leakage. But even when there is very little crosstalk, definition can often be improved, especially when there are two instruments or voices that have similar qualities. For instance, two vocalists can become virtually indistinguishable if their different qualities cannot somehow be made more obvious. This problem is compounded by crosstalk — if the electric guitars and bass are leaking all over the place the whole sound turns to mush. But with careful equalization you can really clean up a situation like this. First, get rid of as much extraneous noise and leakage as possible by reducing the bandwidth of any offending input channels. Then pick out a quality in one or another of the vocalists that will distinguish that voice, and emphasize it. If one voice is a bit more raspy than the other, you might give that channel a little midrange boost. Or perhaps you could boost the lower midrange on one voice and the upper on another — just a little though, so their qualities are highlighted without making them sound unreal. With this

kind of EQ you can give each sound source its own little space in the total perspective.

Just like good pictures, music has to have depth and perspective. If all the sounds are the same loudness, or if they have too many similar qualities, there's no real separation to create that depth perspective. On the other hand, when everything has its own level and quality there's a tremendous dynamic dimension in the music, almost like 3-D movies. The different instruments and voices seem to weave in and out of one another creating a fine, identifiable texture. You can get that kind of sound with the 6100 System — that's why it's designed the way it is.

## OUTPUT LEVEL METERS

The meters come from the factory calibrated so that 0 VU = 1.23V RMS (+4dBm). This is the standard output reference level used in the U.S. However, this reference level may or may not work in your particular situation, so we've put little knobs on the meter calibration controls so you can set them easily. Many of the uses for the meters are already obvious, but we'll mention a few. If you find that you must strictly comply with OSHA loudness regulations, get yourself a relatively accurate SPL meter, then set the 6100's master output level meter to indicate the maximum sound pressure level acceptable. This will also prevent your PA from gradually becoming louder and louder, as the evening wears on due to ear fatigue (and other causes). You can also set your reference level on the monitor output level meter this way so the monitors never become too loud for the band. Once this level is established it becomes easy to see where feedback or ringing is coming from by checking the meter deflection.

## MORE WAYS TO USE THE 6100's CONNECTORS...

All of the 6100's input and output connectors have specific labels because the functions indicated are the most common for that particular circuit or connector. But the labels are definitely not meant to limit the use of any connector or function — here are a few odd ones that are not listed on the chassis.

## EFFECTS RETURN

Run the line output of a tape recorder or record player into the effects return for break music. If the effects return jack is being used for external processing during the show a simple two way switch box, with appropriate connectors, will greatly simplify the change over. Plug a high-Z mike directly into the effects return jack for house announcements. It ain't the best but it works OK. If you need an easy to reach level control for a sub-mixer (which might be on the stage, for instance), run the other mixer's output into the effects return. Pink noise generators and/or test tones can be run through the effects return jack for system set-up.

## EFFECTS SEND

Use it for simultaneous taping of the program if a different mix is required (as it often is). This gives you a house mix and a tape mix, both with EQ. Plug in Hi-Z headphones (600 ohms or greater) use it for spotting troublesome channels by opening one individual channel effects/rev. pot at a time. In a pinch you could use the effects send to generate a stereo mix — honest folks! Simply use the effects send on each channel as the second output.

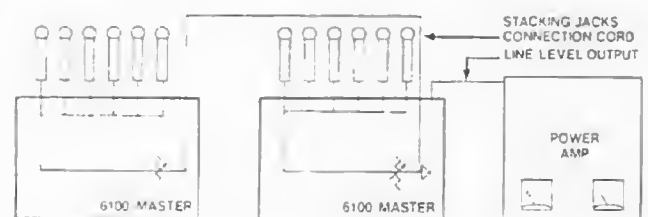
## MONITOR SEND

As a talkback, the monitor system is ideal. Use one input channel for a talkback mike, opening only the monitor send on that channel. This will put the signal on the stage monitors so only the band will hear what is said. The monitor system is also ideal for use as a cue system, because it is unaffected by any other channel control. High-Z phones can be plugged right into the monitor send jack for this purpose.

## CHANNEL PATCHING

For line inputs, just use the "tip" of a stereo phone plug as the input, with no connection made to the "ring". This will automatically shut off the channel preamp while allowing the line level signal to be fed to the mix buss. As an individual channel output just wire the "tip" and "ring" terminals of a regular stereo phone plug together, then take your output from either. This will allow the channel's signal to get into the mix buss normally, while also giving you an output from the channel itself. Again, use shielded wire, and ground everything carefully.

## STACKING JACK



This connector makes a fine tape recorder feed for recording off the main mix buss. Also a fine tape recorder input for playing break music. Although the impedance is lower at this jack than most hi-fi tape recorder manufacturers recommend, it'll probably work. Try it and see. Use the stacking connector to get signal to any peripheral equipment — color organs even.

**NOTE** When stacking two mixers, you must compensate for a change of internal gain structure by turning up the master volumes slightly.

## 8. References

### AutoPad® Volume Controls (how they give you that clean quiet sound)

We are assuming that if you've even begun to read this page you must be interested in finding out what really makes the 6100 tick. Every attempt has been made to keep this explanation brief. Of course, that means that we've jammed a tremendous amount of information into very few words, so you'll probably have to run through it a couple of times before it all sinks in. The basic concepts are actually very simple, even though the explanation is a bit thick. But rest assured, once you understand the operation of gain-controlled mixing systems, you'll know more about mixer design than some of the people who build them.

The two most basic requirements of professional quality microphone mixers, regardless of price, are that they be *quiet* and *distortion free*. For good signal to noise ratio the circuitry itself must be inherently quiet, and you must be able to match the gain to the signal level. And for truly distortion free reproduction, maximum headroom must be maintained at all times. This is why Tapco engineers designed the AutoPad® volume control.

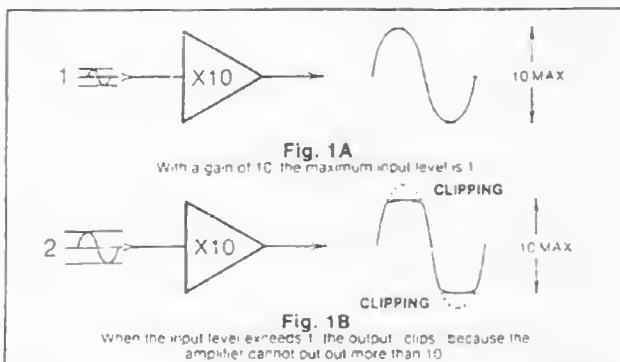
AutoPad® volume controls work much differently from conventional volume controls. Conventional volume controls are usually called faders, because that's what they do. In the conventional mixing system the fader comes after the preamp, where it regulates loudness by reducing the signal level that goes to the mix amp. The conventional input preamp operates at a fixed gain no matter what the input level. When the signals are too loud, distortion occurs, and when they're too soft signal to noise ratio suffers. AutoPad® controls, on the other hand, vary the gain (sensitivity) of the preamp itself — that is, they regulate loudness by changing *how much the circuit amplifies*. This means you can optimize the performance of the preamp for any signal level, eliminating distortion and noise problems. This is how it works:

All electronic circuits generate noise, and mix amps are, by their very nature, noisier than input preamps. Now, there are two general rules that apply: 1) The greater the difference between the amplifier's self-generated noise, and the input level "seen" by the amplifier, the greater the resulting signal to noise ratio. 2) Any circuit that amplifies input signals must also amplify its own noise.

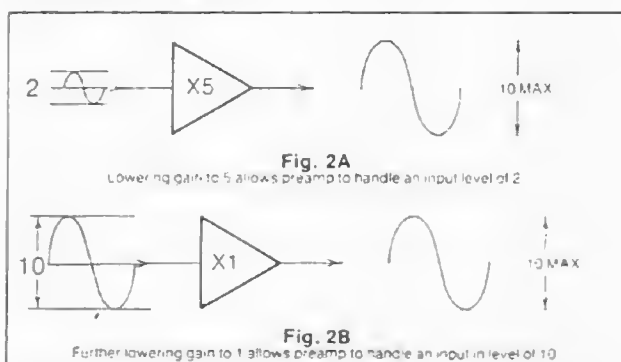
So, if this amplifier makes its own noise louder, it stands to reason we can minimize noise by keeping the gain as low as possible, right? For example, if the amplifier generates 1 unit of noise, and has a gain (multiplication factor) of 10, then the noise at the output of the amp will be 10 units. If the gain were only 5, the output noise would drop to 5 units.

As the term implies, signal to noise ratio is determined by the difference between the signal level *in* the amplifier, and the noise generated by the amplifier. If the amplifier's internal noise has a value of 1, and the maximum signal the amplifier can handle is 1000, the S/N ratio is 1000:1 (60dB). It becomes obvious then that if the amplifier could handle more signal, its signal to noise ratio would be better.

The amount of signal an amplifier can handle is predetermined by the *gain*, and the *maximum output capability* of the amplifier. Unfortunately, the maximum output capability is governed by the power supply voltage, so it cannot be changed. However, the gain can be changed very easily. So, what happens when we change the gain? Suppose the maximum output capability of an amplifier is 10, and the gain is 10. The maximum input level must be 1 (Fig. 1A). When that input level goes beyond 1, the amplifier is overloaded — and we all know what that sounds like! (Fig. 1B). But what



if the gain were lowered to 5? Then the amplifier could handle an input level as high as 2 before the output level tried to go beyond its maximum (Fig. 2A). And if the gain were lowered to 1 (unity), the maximum input level would be 10 (Fig. 2B).



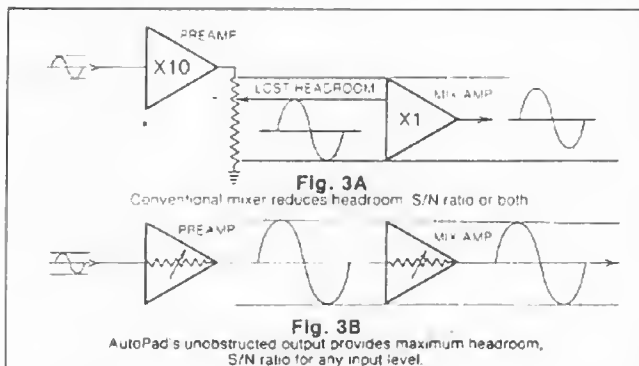
Now, if you understand that bit of electronic theorizing, you can see that if you can control the gain of an amplifier, you really can optimize the performance of that amplifier for many different situations. But how does this affect the operation of a mike mixer? A quick comparison of a gain-controlled mixer system and a conventional mixer will serve to illustrate the differences.

To be fair, we'll assume that all parameters of the preamps and mix amps shown in the drawings are exactly the same. Only the volume controls have been changed to protect the innocent. And we do mean protect, as you'll soon see.

The idea is to optimize S/N ratio and minimize distortion, right? OK. The maximum output capability of these circuits is 10, and the gain is set, for the moment, at 10 in both input circuits. Gain of the mix amps is 1.

We all know that volume controls are usually not run wide open. In fact, most manufacturers of conventional mixers recommend that the faders be operated at about 70% of maximum. This is because it is always neces-

sary to have some control-ability above and below the "normal" volume setting, so the operator can accommodate the ordinary dynamic changes of the music. So, if the preamp gain is 10, and the maximum output is 10, we already know that the maximum input is 1. Look what happens to this output, though, when it leaves the conventional preamp. *The fader reduces its level by at least 30%! (Fig 3A)* Remember now: Mix



amps are inherently much noisier than preamps. So, to come up with a quiet signal we have to cram as much real level into that mix amp as possible. It would somehow seem self defeating to reduce the signal strength before it can get to the mix amp, wouldn't it? There are two solutions. We can increase the gain of either the preamp, or the mix amp, by 30% to make up for the losses in the fader. But, if we *increase* the preamp gain 30%, we have to *reduce* the maximum input level by 30% to stay within the maximum output limit of the preamp. **THAT MEANS WE'VE JUST SACRIFICED 30% OF OUR AVAILABLE HEADROOM TO THAT FADER.** If we increase the gain of the relatively noisy mix amp we simultaneously increase the amount of noise at the output, because every amplifier amplifies its own noise as well as the signal. **THAT MEANS THE OVERALL SIGNAL TO NOISE RATIO IS REDUCED 30%.** With the AutoPad® volume control, the full output of the preamp is available to the mix amp, with no losses. Right away you can see that the gain control provides maximum headroom, because the AutoPad® preamp is still able to handle an input of 1, while the maximum level that the conventional preamp can handle has been reduced by 30%. S/N ratio is automatically optimized too, because the signal is amplified by the quieter preamp and merely passed along by the mixing stage.

All good and well for an input level of 1, but what happens when that actual input level drops to .001? Well, the conventional preamp does what it can, throws away 30%, and passes the result along to the mix amp. In this case it's likely that there's not enough signal left to disguise the noise generated by the mix amp, so the overall output is pretty noisy. In the same situation, the AutoPad® preamp's gain could be increased to as much as 1000. The increased gain would allow the mix amp to "see" enough signal to perform its very necessary function quietly.

By the same token, what happens to these two preamp systems when the signal level goes up — to 2, for instance. With the conventional preamp, a pad must be

used to protect the input from overload. A pad is a very simple resistive circuit that performs essentially the same function as a fader. It reduces the signal level. Of course with the AutoPad® preamp we'd simply turn down the gain a little, allowing the preamp to handle the increased signal level. So what's wrong with a pad, anyway? Nothing, really. Pads work just fine, for their intended purpose. We already know that the more signal you can get into the front end of that preamp, the better the S/N ratio will be. If you put in a 10dB pad, you've actually thrown away 10dB of S/N ratio. Now, the theory behind a pad is that your signal level should be 10dB too hot before you switch in that pad. Unfortunately, however, in real life signals don't come packaged in nice neat 10dB increments. That's why AutoPad® volume controls were made infinitely variable — so you can precisely match the preamp gain to any signal level. The only other drawback of the pad is that they must be, by design, switchable. This means that pads are able to make only abrupt volume changes. Because AutoPad® controls are continuously variable, they are able to make smooth volume changes, allowing you to create true dynamics without fear of overload distortion.

Tapco's AutoPad® volume controls have solved the seemingly unsolvable problems of noise and distortion, without great expense. With AutoPad® you get the best performance under all conditions.

#### NOTES:

## 9. 6100 Specifications

### GENERAL

Frequency response	15Hz to 40KHz $\pm 1\text{dB}$
THD	less than .08%
(at 1KHz, 30mV RMS input, 5V RMS output)	
Equivalent input noise (10mV RMS input, 1V RMS output, 20Hz to 20KHz, 150 ohm source)	-128dBV (6100RB/EB) -126dBV (6100 RA/EA)
Output noise (residual master gain off)	22uV (93dB below 1 volt)
Signal to noise ratio (input to output —50dBm ref level, 20Hz to 20KHz unweighted)	76dB
Total available gain	greater than 90dB
Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+17dBm
Output impedance (actual)	130 ohms
Output meter sensitivity	adjustable, off to 0 VU = -18dBm (100mV)
Mic EQ	-9dB at 20KHz
Rumble filter	-6dB at 100Hz, 6dB per octave slope

### INPUT CHANNELS — 6 on master unit, 8 on expander

Microphone impedance matching	30 to 600 ohms
Input transformer (B only)	Custom built, large high nickel alloy type
Common mode rejection (B only)	105dB
RF interference filter (A only)	-28dB at 1MHz -55 at 27MHz (CB frequency)
Maximum input level	-2dBm
Bass control	switchable 12dB points, 80Hz and 200Hz, $\pm 18\text{dB}$ shelving
Midrange control	switchable center frequencies, 800Hz and 2.5KHz, $\pm 12\text{dB}$ peak and dip
Treble control	fixed at approximately 10KHz $\pm 18\text{dB}$ shelving

### CHANNEL PATCHING — channels 1 & 2 or 9 & 10

Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+17dBm
Output impedance	130 ohms
Return impedance	6.8K ohms

### MONITOR SYSTEM — a completely independent (pre-everything) submixer for stage monitors

Frequency response	15Hz to 40KHz $\pm 1\text{dB}$
THD	.08%
(at 1KHz, 30mV RMS input, 5V RMS output)	

Equivalent input noise (10mV RMS input, 1V RMS output, 20Hz to 20KHz, 150 ohm source)	-126dBV
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Signal to noise ratio (input to output —50dBm ref level, 20Hz to 20KHz unweighted)	76dB
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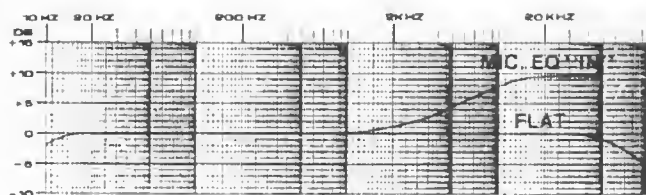
Total available gain	87dB
Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+17dBm
Output impedance	130 ohms
Output meter sensitivity	adjustable, off to 0 VU = -18dBm (100mV)

Low cut	-6dB at 100Hz, 6dB per octave slope
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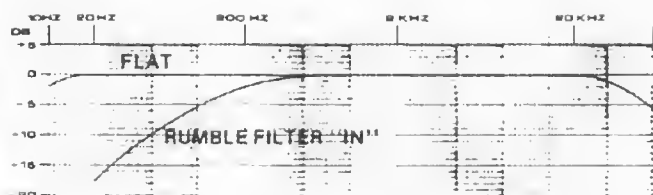
### EFFECTS SYSTEM — a post EQ sub mixer for internal reverb, or external effects

Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+17dBm
Effects send output impedance	130 ohms
Effects return maximum input	10 volts RMS
Effects return impedance	greater than 50K ohms
Reverberation system	delay 30 milliseconds decay —60dB at 1.9 seconds
Reverberation frequency response	adjustable — Contour Mid Boost

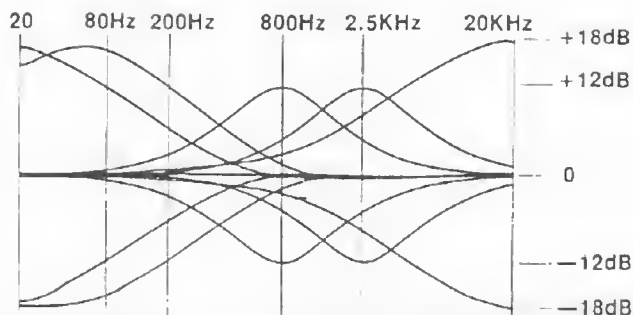
All specifications subject to change without notice



Microphone Equalization

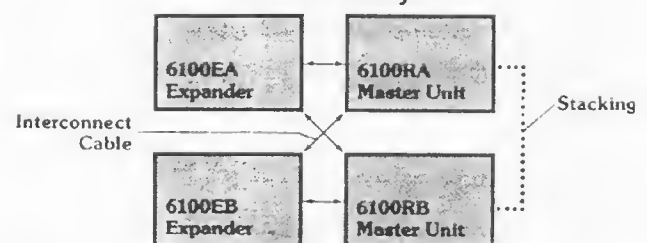


Rumble Filter



Channel EQ Curves

### 6100 Family



You can use either master control unit with either expander — you can even stack master control units!

## MONITOR SEND STAGE

### SYMPTOMS

Dead monitor channel

### CAUSE

1. IC-4 bad
2. Short in mon. vol. pot
3. Bridge on P.C.B.
1. Mon. vol. pot bad
2. Broken land or solder joint

Full vol. on monitor chan.

Popcorn or white noise in mon. stage

1. IC-4 bad

Unusual hard distortion in monitor channel

1. IC-4 bad

## REVERB DRIVE STAGE

### SYMPTOMS

Reverb drive dead

### CAUSE

1. Bad rev. dr. cable
2. IC-3 bad
3. Bridges on P.C.B.
4. Check inside reverb tank for broken wires

Reverb drive loses highs

1. Shorted rev. dr. cable (verify continuity)

Reverb drive low freq. rolloff

1. C-18 bad

Reverb drive oscillates (with 600 ohm load)

1. C-23, C-25 bad
2. Broken land or solder joint
3. P.C. to chassis ground bad
4. Tighten all jacks

Popcorn or white noise reverb in drive

1. IC-3 bad

## REVERB PICK-UP STAGE

### SYMPTOMS

Reverb pickup dead

### CAUSE

1. Reverb pickup cable bad
2. Pick up cable not plugged into P.C. Board
3. Broken land or solder joint at P.C. mounted jack
4. Check inside reverb tank for broken wires
5. IC-1 bad
6. IC-2 bad (on pre-17J boards)
7. Shorted reverb level pot
8. Black wire soldered to hot side of P.C.B. phono jack

Reverb pick-up oscillation

1. P.C. to chassis ground bad
2. Tighten all jack nuts
3. C-33 bad

Popcorn or white noise in reverb pickup

1. IC-1 bad
2. IC-2 bad (on pre-17J boards)

Hum in Reverb pickup

1. IC regulated 6100 with no black ground wire to phono ground
2. IC-1 bad
3. IC-2 bad (on pre-17J boards)

Reverb contour taper rate

1. Reverb contour pot wrong value

## EFFECTS SEND STAGE

### SYMPTOMS

Effects send dead

### CAUSE

1. Grounded effects send jack
2. Effects send wire (orange) pinched to chassis
3. Jumpers between input & output board missing
4. IC-2 bad (IC-3 on 17J board)
5. Bad effects send pot
6. Broken land or solder joint

Popcorn or white noise in effects send

1. IC-2 bad (IC-3 on 17J board)

Oscillation in effects send

1. Bridge on effects send buss
2. P.C. to chassis ground bad
3. Tighten all jack nuts

## EFFECTS RETURN STAGE

### SYMPTOMS

Effects return dead

### CAUSE

1. Effects return jack grounded
2. Effects return wire pinched to chassis
3. IC-2 bad
4. Effects return pot bad

Effects return oscillation

1. P.C. to chassis ground bad
2. Tighten all jack nuts

Popcorn or white noise in effects return

1. IC-2 bad

## MASTER VOLUME STAGE

### SYMPTOMS

Master dead

### CAUSE

1. IC-1 bad
2. Master o/p jack grounded
3. Master o/p wire yellow pinched to chassis
4. Master vol. pot bad

Stacking jack

1. Stacking jack grounded
2. Stacking o/p wire (green) pinched to chassis

Master o/p oscillation

1. P.C. to chassis ground bad
2. Tighten all jack nuts
3. C-47 bad

Popcorn or white noise

Master in o/p (fades with master vol)

1. IC-1 bad

Popcorn or white noise in master o/p (with master vol. off)

1. IC-2 bad (IC-1 on 17J board)

No Mic EO

1. Broken land, solder joint, or switch

No rumble filter

1. Broken land, solder joint, or switch

## MONITOR VOLUME STAGE

### SYMPTOMS

Monitor master dead

### CAUSE

1. IC-1 bad (IC-2 on 17J board)
2. Monitor o/p jack grounded
3. Monitor o/p wire (blue) pinched to chassis
4. Monitor vol. pot bad

Monitor o/p oscillation

1. P.C. to chassis ground bad
2. Tighten all jack nuts
3. C-41 bad

Popcorn or white noise in Monitor master (fades with Monitor master)

1. IC-1 bad (IC-2 on 17J board)

Popcorn or white noise in Monitor master (with Mon. mas. off)

1. IC-1 bad (IC-2 on 17J board)

No rumble filter

1. Intermittent or bad switch
2. Broken land or solder joint

## METER DRIVE CIRCUIT

### SYMPTOMS

No metering

### CAUSE

1. Q-2 bad (check w/scope, "A/B" meter ckts.)
2. D-12 and D-13 bad
3. Bad meter (jumper to good side of meter and verify)
4. Broken land or solder joint
5. R-91 bad

## EXPANDER RELATED SYMPTOMS

### SYMPTOMS

Noise in expander cable

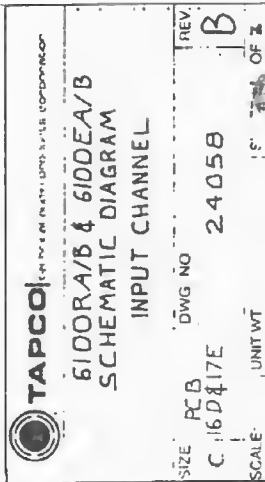
### CAUSE

1. Old expander cable?? (modify)
2. Faulty solder connection
3. Faulty Elco cable

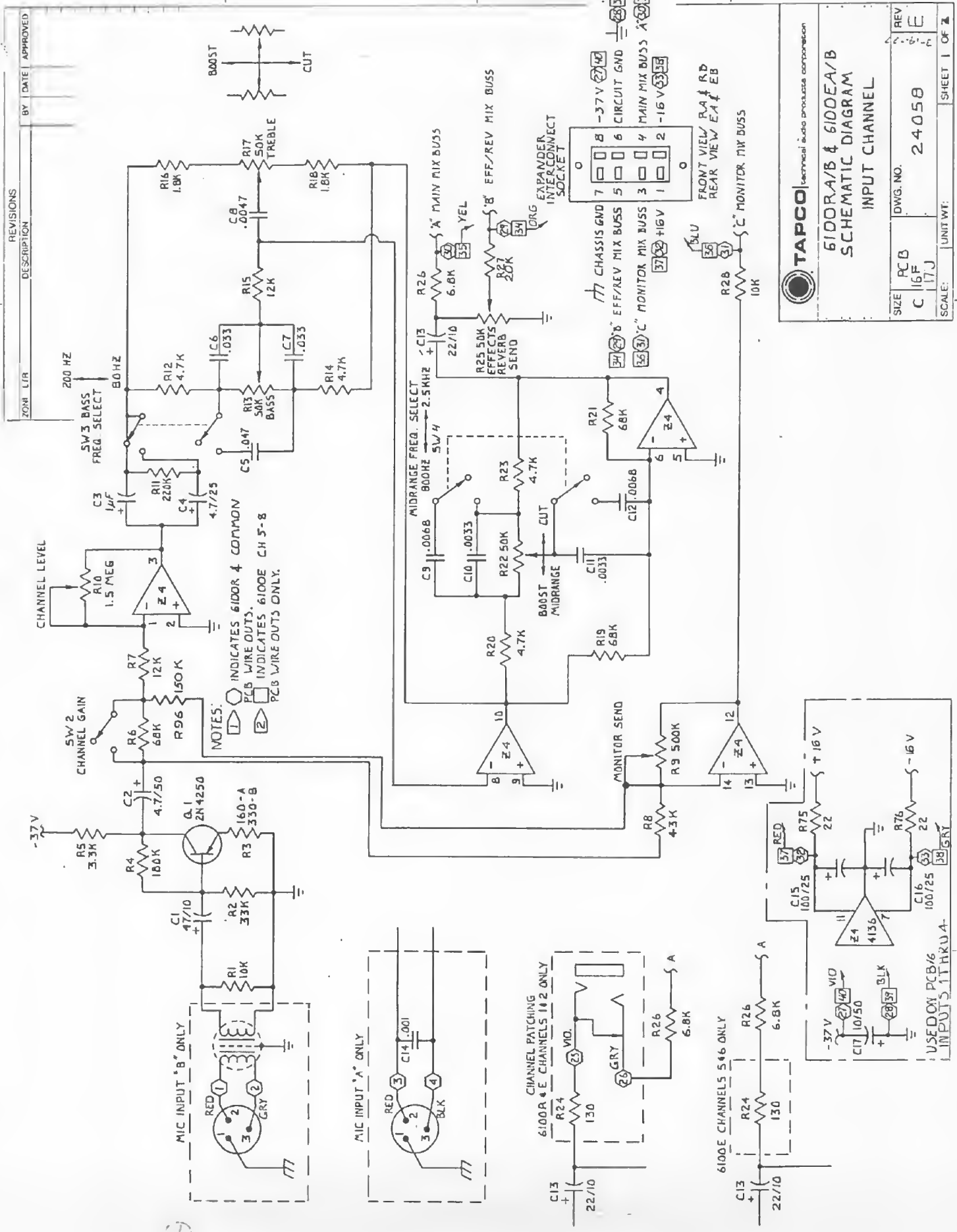
Hum when expander is used

1. Old expander cable?? (modify)
2. Faulty regulator





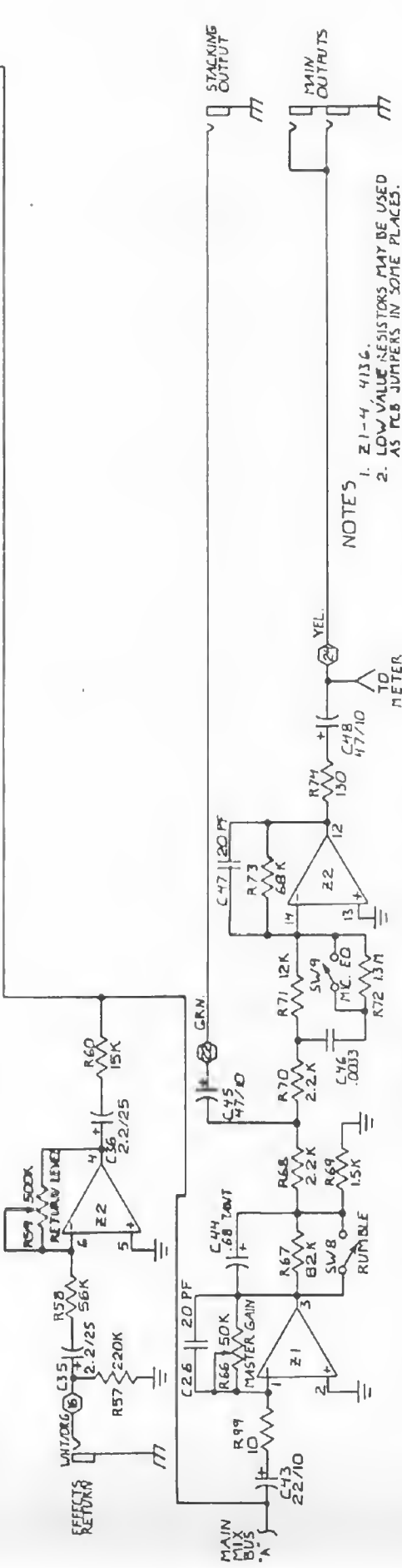
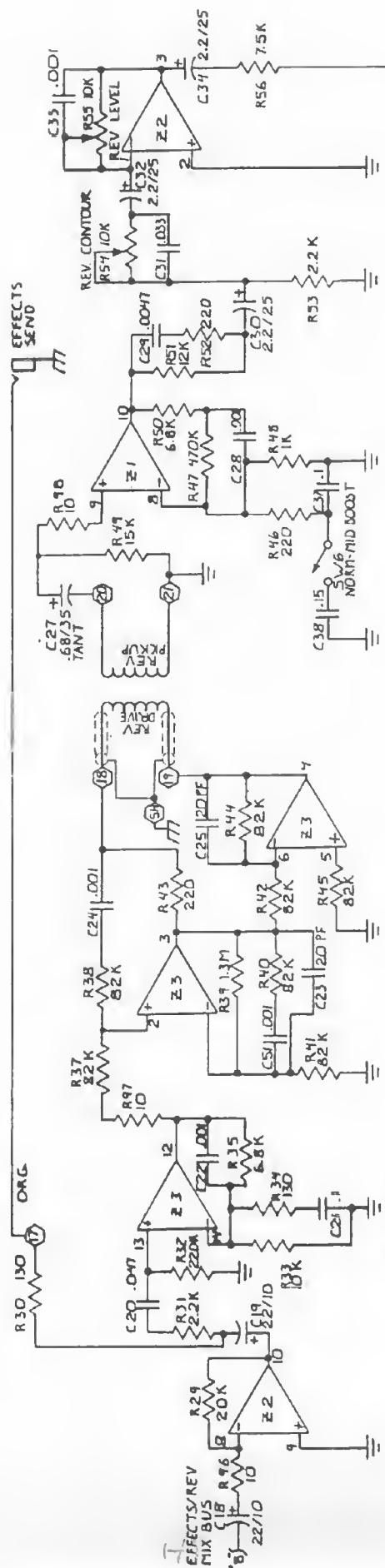




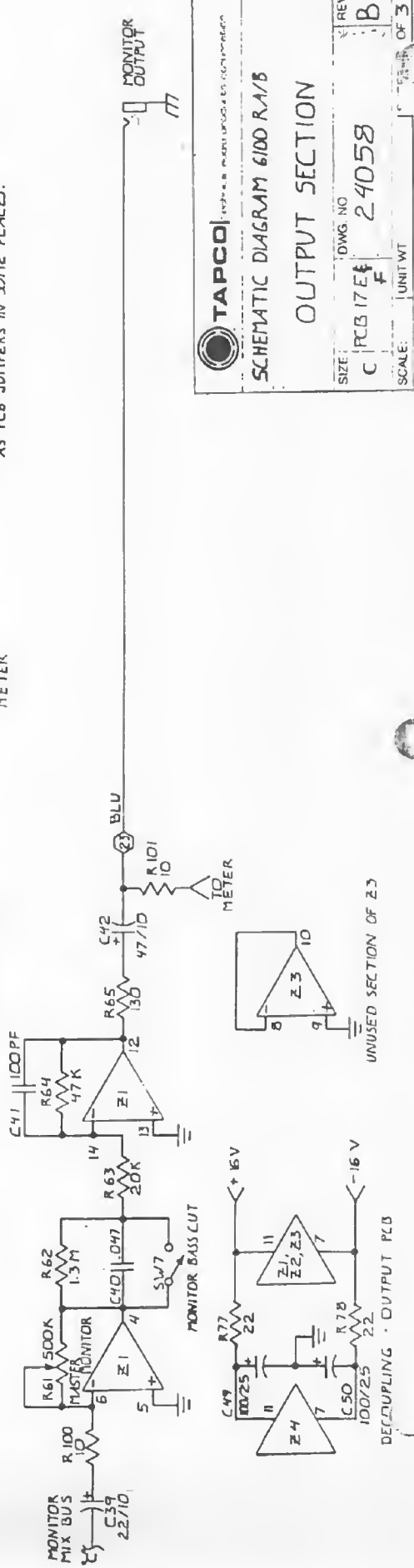








NOTES  
1. Z1-4, 4136.  
2. LOW VALUE RESISTORS MAY BE USED  
AS PCB JUMPERS IN SOME PLACES.



		SCHEMATIC DIAGRAM 6100 RA/B	
SIZE: C	PCB 17E4	DWG NO: 24058	REV: B
SCALE:		UNIT WT:	
OF 3		OF 3	

UNUSED SECTION OF Z3

DECOUPLING - OUTPUT PCB

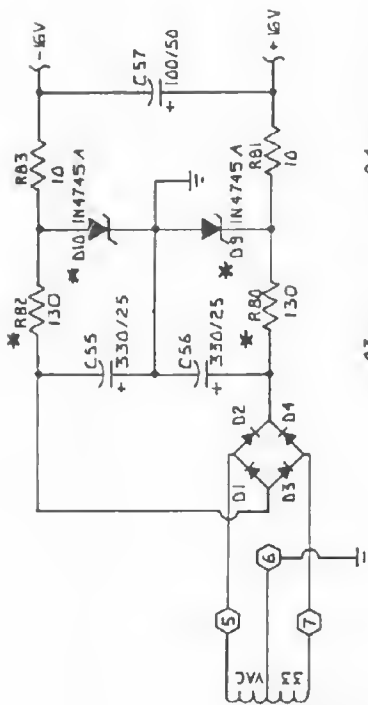




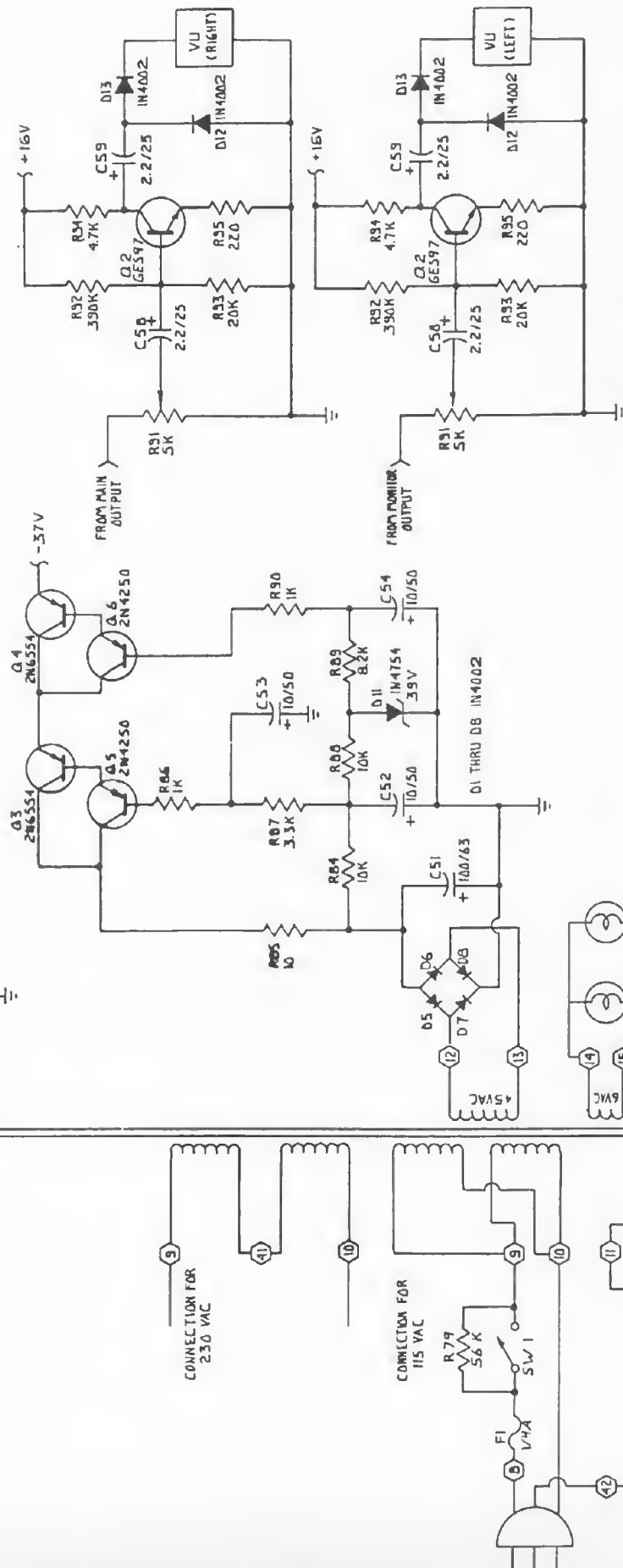








ALL UNITS PRIOR TO 0960002  
R-80 + R-82 ARE 68Ω  
D-9 + D-10 ARE 1N4746A

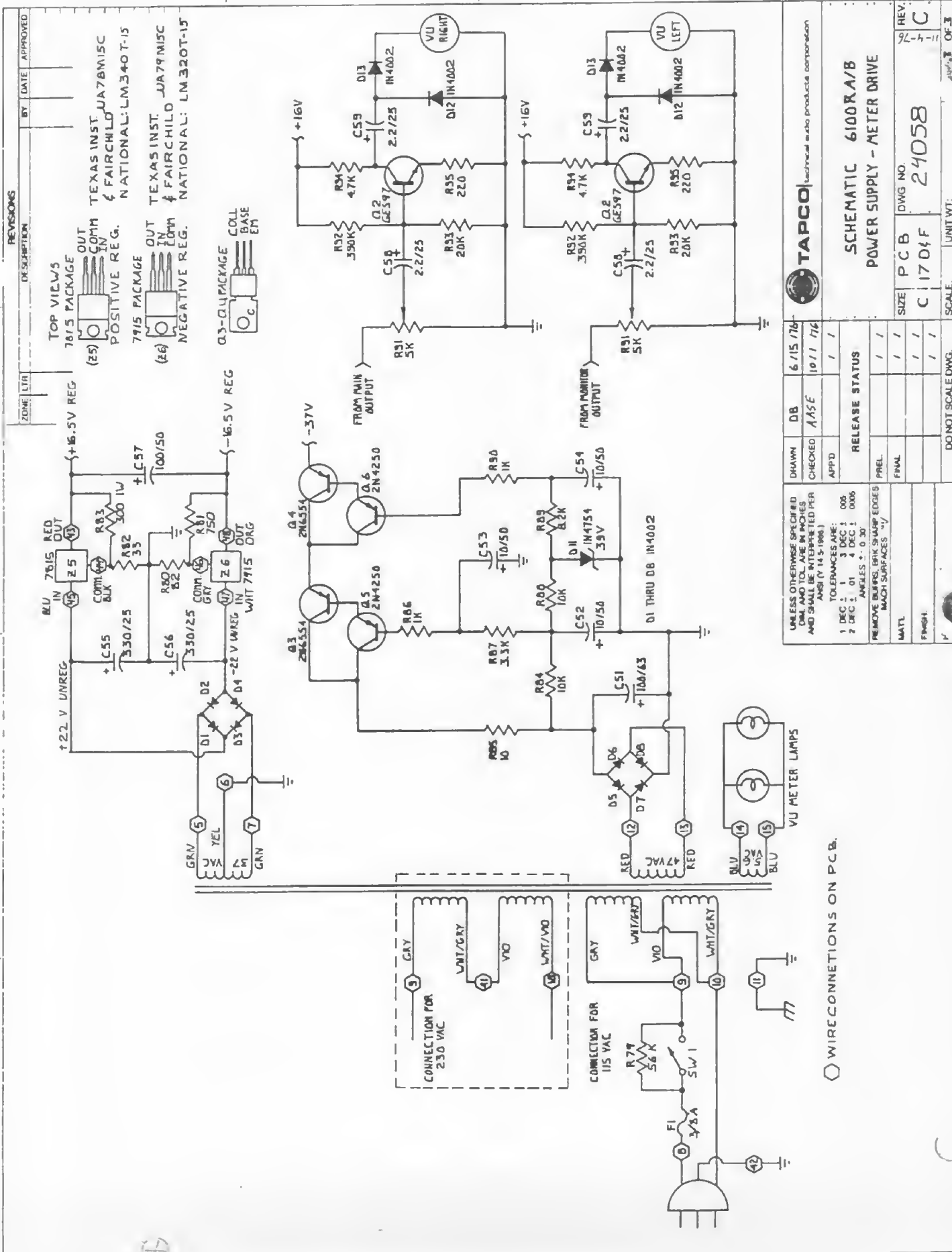


TAPCO ENGINEERING AND PRODUCTION

# SCHEMATIC 6100RA/B POWER SUPPLY - METER DRIVE

SIZE	C	DWG. NO.	2405B	REV.	B
SCALE		UNIT WT.			SHEET 3 OF 3







# PARTS LIST

801005..... ASSY BOTTOM 61RA/B  
 804013..... ASSY CABLE REV. DR.  
 804012..... REV. P.U. CABLE  
 800015..... PCB INPUT ASSY  
 800016..... PCB IN/OUT ASSY  
 300001..... PHONE JACK  
 300004..... PHONO JACK  
 300008..... XLR CONN  
 300009..... STEREO PHONE JACK W/SW  
 302051..... PWR XFMR  
 804020..... LINE CORD  
 303003..... STRAIN RELIEF  
 300025..... CH.MT. ELCO (MALE — 61E)  
 300026..... CH.MT. ELCO (FEMALE — 61R)  
 400001..... POINTER KNOB  
 400002..... NUMBERED KNOB  
 400004..... INSERT (Dk BLUE)  
 400005..... INSERT (Lt BLUE)  
 400006..... INSERT (GREY)  
 450022..... CHASSIS SCREENED 61RA  
 450025..... CHASSIS SCREENED 61EA  
 450026..... CHASSIS SCREENED 61RB  
 450027..... CHASSIS SCREENED 61EB  
 500070..... 4— 40 x 3/8 SCREW  
 500592..... 4— 40 KEP NUT  
 500102..... 6— 32 x 3/8 SCREW  
 500190..... 6— 32 KEP NUT  
 500680..... LGE STAR WASHER  
 500681..... WASHER THIN STEEL (Appearance)  
 303006..... REVERB UNIT  
 303007..... FEET

005400..... 9610 1.5M A-TAPER (PC)  
 005401..... 9611 50K LIN (PC)  
 005407..... 9617 500K A-TAPER (PC)  
 005413..... 9618 10K A-TAPER (PC)  
 005414..... 9619 50K A-TAPER (PC)  
 005415..... TRIMPOT 5K A-TAPER

003001..... .001/50 MYLAR  
 003019..... .0033/50 MYLAR  
 003025..... .0047/50 MYLAR  
 003030..... .0068/50 MYLAR  
 003055..... .033/50 MYLAR  
 003061..... .047/50 MYLAR  
 003073..... .1/50 MYLAR  
 003079..... .15/50 MYLAR  
 004013..... 20PF/100 CER  
 004037..... 100PF/100 CER  
 004050..... 470PF/100 CER  
 002016..... .68/35 TANT  
 002019..... 1/35 TANT  
 001403..... 2.2/25 ELEC  
 001405..... 4.7/25 ELEC  
 001641..... 4.7/50 ELEC  
 001606..... 10/50 ELEC  
 001208..... 22/10 ELEC

001211..... 47/10 ELEC  
 001612..... 100/50 ELEC  
 001712..... 100/63 ELEC  
 001415..... 330/25 ELEC

006001..... XSTR GES-97  
 006002..... XSTR 2N4250  
 006006..... XSTR 2N6554  
 007004..... IC 4136  
 007101..... IC 7815 + REG  
 007151..... IC 7915 — REG  
 303211..... MYLAR INS.  
 303300..... POWER TAB SHOULDER WASHER  
 008044..... IN4754A 39v ZENER  
 008022..... IN4002 PWR DIODE

301002..... PDL SW White  
 301004..... PDL SW Red  
 301006..... SL. SW Grey  
 301007..... SL. SW Blue

450030..... REG. HEATSINK  
 301043..... LAMP  
 302043..... MATCHING XFMR  
 302045..... SHIELD  
 300018..... PCB 3 PIN MOLEX  
 300020..... PCB PHONO JACK  
 455001..... VU METER DUAL  
 804017..... ELCO EXPANDER CABLE

# 6100 SPECIFICATIONS

## GENERAL

Frequency response	15Hz to 40KHz $\pm$ 1dB
THD (at 1KHz, 30mV RMS input, 5V RMS output)	less than .08%
Equivalent input noise (10mV RMS input, 1V RMS output, 20Hz to 20KHz, 150 ohm source)	-128dBV (6100RB/EB) -126dBV (6100 RA/EA)
Output noise (residual master gain off)	22uV (93dB below 1 volt)
Signal to noise ratio (input to output, -50dBm ref. level, 20Hz to 20KHz unweighted)	76dB
Total available gain	greater than 90dB
Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+ 17dBm
Output impedance (actual)	130 ohms
Output meter sensitivity	adjustable, off to 0 VU = -18dBm (100mV)
Mic EO	+ 9dB at 20KHz
Rumble filter	-6dB at 100Hz, 6dB per octave slope

## INPUT CHANNELS — 6 on master unit, 8 on expander

Microphone impedance matching	30 to 600 ohms
Input transformer (B only)	Custom built, large high nickel alloy type
Common mode rejection (B only)	105dB
RF interference filter (A only)	-28dB at 1MHz -55 at 27MHz (CB frequency)
Maximum input level	-2dBm
Bass control	switchable 12dB points, 80Hz and 200Hz, $\pm$ 18dB shelving
Midrange control	switchable center frequencies, 800Hz and 2.5KHz, $\pm$ 12dB peak and dip
Treble control	fixed at approximately 10KHz, $\pm$ 18dB shelving

## CHANNEL PATCHING — channels 1 & 2 or 9 & 10

Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+ 17dBm
Output impedance	130 ohms
Return impedance	6.8K ohms

## MONITOR SYSTEM — a completely independent (pre-everything) submixer for stage monitors

Frequency response	15Hz to 40KHz $\pm$ 1dB
T.H.D. (at 1KHz, 30mV RMS input, 5V RMS output)	08%
Equivalent input noise (10mV RMS input, 1V RMS output, 20Hz to 20KHz, 150 ohm source)	-128dBV
Signal to noise ratio (input to output, -50dBm ref. level, 20Hz to 20KHz unweighted)	76dB
Total available gain	87dB
Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+ 17dBm
Output impedance	130 ohms
Output meter sensitivity	adjustable, off to 0 VU = -18dBm (100mV)
Low cut	-6dB at 100Hz, 6dB per octave slope

## EFFECTS SYSTEM — a post EQ sub mixer for internal reverb, or external effects

Maximum output level into 5K ohm load	9 volts RMS
Maximum output level into 600 ohm load	+ 17dBm
Effects send output impedance	130 ohms
Effects return maximum input	10 volts RMS
Effects return impedance	greater than 50K ohms
Reverberation system	delay: 30 milliseconds decay: -60dB at 1.9 seconds
Reverberation frequency response	adjustable — Contour, Mid Boost

All specifications subject to change without notice.

## FACTORY SERVICE

Tapco has a staff of highly qualified service personnel who can assist with any field problems which may arise, and are able to answer questions concerning any aspect of the use and performance of our products. Our telephone number is area code 206 883-3510. If you wish written information, replacement parts, or factory service, our address is:

TAPCO  
3810 148th Ave. N.E.  
Redmond, WA 98052



# WARRANTY

## LIMITED WARRANTY

(a) TAPCO warrants the materials, workmanship and proper functioning of its products for a period of one full year from the date of original purchase. If any defects are found in the materials or workmanship of TAPCO products, or if the product ceases to properly function within one year from the date of first purchase, TAPCO will repair or replace any non-conforming materials through the nearest TAPCO authorized warranty service center.

(b) Purchaser must return the product to the TAPCO authorized warranty service center, freight prepaid. A list of authorized warranty service centers is available at all TAPCO authorized dealers. Claims must first be sent to any TAPCO authorized warranty service center. If claims are not resolved by the TAPCO authorized warranty service center, any warranty claim should be sent to:

TECHNICAL AUDIO PRODUCTS CORPORATION  
3810-148th Avenue N.E.

Redmond, WA 98052 Phone (206) 883-3510

(c) TAPCO reserves the right to inspect any products which are the subject of any warranty claim prior to repairing or replacing. Any products which do not conform to this warranty shall be repaired or replaced by TAPCO as soon as possible following receipt of the product and warranty claim, but in no event later than 30 days after receipt of the product. Any product for which a warranty claim is accepted will be returned to the purchaser and cost of shipping and insurance will be factory prepaid. This warranty gives specific legal rights. The purchaser also has implied warranty rights, and may also have other rights which vary from state to state.

(d) This warranty is extended to the purchaser and to any purchaser from him for value.

(e) THE ABOVE WARRANTY IS THE SOLE WARRANTY GIVEN BY TAPCO, AND IS IN LIEU OF ALL OTHER EXPRESS WARRANTIES. ALL IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE SHALL BE STRICTLY LIMITED IN DURATION TO ONE YEAR FROM THE DATE OF ORIGINAL PURCHASE AND UPON THE EXPIRATION OF ONE YEAR TAPCO SHALL HAVE NO FURTHER WARRANTY OBLIGATION OF ANY KIND WHETHER EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY. FURTHER, TAPCO SHALL IN NO EVENT BE OBLIGATED FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES AS A RESULT OF ANY DEFECT OR ANY WARRANTY CLAIM, WHETHER EXPRESS OR IMPLIED. Some states do not allow exclusion or limitation of incidental or consequential damages or limitation on how long implied warranties last, so the above limitations and exclusions may not apply to you.

(f) This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

(g) TAPCO does not authorize any third party, including any dealer or authorized warranty service center to assume any liability of TAPCO or make any warranty for TAPCO.

Warranty registration cards must be completed and mailed to TAPCO within 30 days of purchase.

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3810-148th Avenue N.E.  
Redmond, WA 98052 Phone (206) 883-3510